

Spiders of the genus *Plexippus* from China (Araneae: Salticidae)

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Spiders of the genus *Plexippus* from China (Araneae: Salticidae). - Five *Plexippus* species, including one new species, *Plexippus yinae* Peng & Li, are reported from China. A description of the new species and diagnoses of the known species are given. Distributional data, a key to these species, and illustrations of body and genital organs are provided.

Key-words: Araneae - Salticidae - *Plexippus* - review - China.

INTRODUCTION

The spider genus *Plexippus* was established by C. L. Koch (1846) to accommodate *Plexippus ligo* C. L. Koch, now in synonymy with *Plexippus paykulli* (Audouin, 1826). According to the catalogue of Prószyński (2002), this salticid genus is now represented by 53 species worldwide, including 4 known species occurring in China. During our study of *Plexippus* material from China, one new species has been identified. A description of this new species and diagnoses of the other species known from China are given in the present paper.

MATERIAL AND METHODS

Specimens, preserved in 80% ethanol, were examined under SZ40-Olympus stereomicroscope and illustrated. The epigyna were drawn before they were dissected from the spider abdomina, while the vulvae were drawn after they were macerated in lactic acid. The leg measurements are given in the following sequence: Total (femur, patella + tibia, metatarsus, tarsus). All measurements are given in millimeters.

The material examined is deposited in the Institute of Zoology, Chinese Academy of Sciences in Beijing (IZCAS), in the Hunan Normal University in Changsha, China (HNU), and in the Muséum d'histoire naturelle in Genève, Switzerland (MHNG).

For each species only the following synonyms and references are given in the text: References to relevant papers by Chinese colleagues, and synonyms not listed in Platnick's spider catalogue (Platnick, 2003) or in Prószyński's Salticidae catalogue (Prószyński, 2002).

Abbreviations used: AER-anterior eye row, AL-abdomen length, ALE-anterior lateral eye, AME-anterior median eye, AW-abdomen width, CL-carapace length, CLYH-clypeus height, CW-carapace width, EFL-eye field length, PER-posterior eye row, PLE-posterior lateral eye, TL-total length.

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TAXONOMY

Plexippus C. L. Koch, 1846

Plexippus C. L. Koch, 1846, Die Arachniden 13:107.

Type species: Plexippus paykulli (Audouin, 1826)

The genus *Plexippus* was used in the 19th century to accommodate a variety of non-related species. Many of them are not related to the type species of the genus (Bohdanowicz & Prószyński, 1987). The known species of the genus are distributed in almost all zoogeographical regions (Zabka, 1985).

Diagnosis: Medium to large spiders with elevated cephalothorax. Ocular area occupying less than half of carapace length, length about two thirds of width, PME located at the midpoint between ALE and PLE; both carapace and abdomen with distinct longitudinal bands. Palpal organ: bulb usually longer than wide, its prolateral side strongly sclerotized and spatuliform, posterior end of bulb usually with small lobe (Figs 2B, 3B, 4B, 5B). Epigynum usually with central anterior hood (Figs 1B, 3E), copulatory opening narrow and usually slit-shaped, spermathecae spherical and connected to short stout ducts (Figs 2F, 3F, 4F).

KEY TO *PLEXIPPUS* SPECIES OCCURRING IN CHINA

- | | | |
|---|--|------------------------|
| 1 | Male | 2 |
| - | Female | 5 |
| 2 | Bulb with serrated prolateral side (Figs 4B, 5B) | 3 |
| - | Bulb with smooth prolateral side (Figs 2B, 3B) | 4 |
| 3 | Embolus long and thin, with pointed tip (Fig. 4B) | <i>P. setipes</i> |
| - | Embolus short and stout, with truncated tip (Fig. 5B) | <i>P. yinae</i> sp. n. |
| 4 | Tibial apophysis close to cymbium, tip of apophysis reaching beyond the base of embolus in ventral view (Fig. 3B) | <i>P. petersi</i> |
| - | Tibial apophysis not close to cymbium, tip of apophysis not reaching the base of embolus in ventral view (Fig. 2B) | <i>P. paykulli</i> |
| 5 | Epigynal hood close to anterior margin of epigynum (Figs 1C, 3E) | 6 |
| - | Epigynal hood in a central position on the epigynum (Figs 2E, 4E) | 7 |
| 6 | Copulatory opening wide, V-shaped (Fig. 1B) | <i>P. bhutani</i> |
| - | Copulatory opening slit-shaped (Fig. 3E) | <i>P. petersi</i> |
| 7 | Epigynum with deep mid-lateral incisions (Figs 2E-F) | <i>P. paykulli</i> |
| - | Epigynum without lateral incisions (Figs 4E-F) | <i>P. setipes</i> |

Plexippus bhutani Zabka, 1990

Figs 1A-C

Plexippus bhutani: Xie & Peng, 1993: 21, figs 9-11 (♀); Peng *et al.*, 1993: 180, figs 629-631 (♀); Song *et al.*, 1999: 540, figs 311a, 312a (♀).

Material examined: 1 ♀ (MHNG), Wuying Town, Weishan District, Yunnan Province, China, 8.VI.1999, leg. Z. X. Li; 1 ♀ (IZCAS), Mt. Cangshan, Dali Prefecture, Yunnan Province, 9.III.2002, leg. Z. X. Li.

Diagnosis. This species is similar to *P. petersi* (Karsch, 1878), but can be separated from the latter by: 1. epigynum with much wider posterior margin versus as wide as anterior margin in *P. petersi* (Figs 1B-C, versus Figs 3E-F); 2. epigynal hood close to top of epigynum, that of *P. petersi* close to median area; 3. copulatory opening wide,

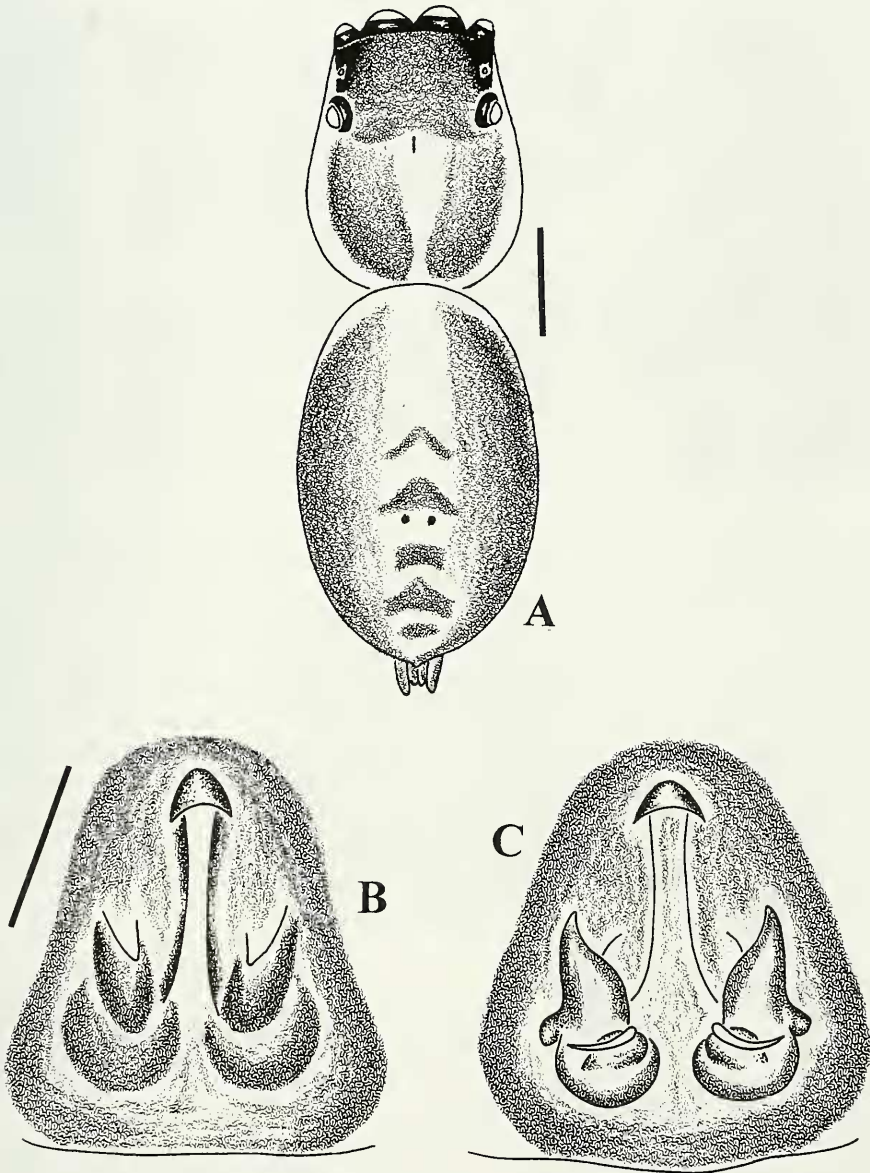


FIG. 1

Plexippus bhutani Zabka, 1990: A. Body of female; B. Epigynum; C. Vulva. Scales = 1.0 mm (A), 0.2 mm (B-C).

V-shaped, close to median area, that of *P. petersi* narrow, slit-shaped and located in the anterior half of epigynum (Fig. 1B, versus Fig. 3E); 4. copulatory ducts much shorter (Fig. 1C, versus Fig. 3F).

Distribution. Bhutan, China. (Yunnan).

Plexippus paykulli (Audouin, 1826)

Figs 2A-F

Plexippus paykulli: Lee, 1966: 74, figs 27i-k (♂ ♀); Yin & Wang, 1979: 37, figs 21A-E (♂ ♀); Yin *et al.*, 1983: 34, fig. 4C (♂); Hu, 1984: 386, figs 402.1-6 (♂ ♀); Guo, 1985: 182, figs 2-105.1-3 (♂ ♀); Song, 1987: 300, fig. 256 (♂ ♀); Zhang, 1987: 250, figs 222.1-3 (♂ ♀); Feng, 1990: 213, figs 188.1-6 (♂ ♀); Chen & Gao, 1990: 194, figs 247a-c (♂ ♀); Chen & Zhang, 1991: 296, figs 312.1-5 (♂ ♀); Song *et al.*, 1993: 886, figs 62A-D (♂ ♀); Peng *et al.*, 1993: 181, figs 632-638 (♂ ♀); Zhao, 1993: 417, figs 217a-c (♂ ♀); Chen, 1996: 137; Song *et al.*, 1999: 540, figs 14K, 310P, 311B, 328L (♂ ♀); Song *et al.*, 2001: 451, figs 301A-D (♂ ♀).

Plexippus incognitus Lee, 1966: 74, figs 28a-c (♂ ♀, misidentified); Hu, 1984: 384, fig. 401 (♂ ♀ misidentified); Song *et al.*, 1999: 540 (misidentified).

Material examined: 1 ♀ (MHNG), Jinxiu District, Guangxi Zhuang Autonomous Region, China, 13.V.1999, leg. G. Q. Zhang; 1 ♀ (IZCAS), Pingxiang City, Guangxi Zhuang Autonomous Region, 22.III.1998, leg. M. Wu; 1 ♂ (MHNG), Fulong Town, Fangcheng District, Guangxi Zhuang Autonomous Region, 23.V.1999, leg. G. Q. Zhang; 2 ♀ (HNU), Fugong District, Yunnan Province, 25.VII.2000, leg. D. Kavanaugh & H. M. Yan; 1 ♂ (IZCAS), Wuying Town, Weishan District, Yunnan Province, 5.VIII.1999, leg. X. L. Fan; Jiancao Town, Yunlong District, Yunnan Province, leg. E. B. Yang (IZCAS); 1 ♀ (IZCAS), Midu District, Yunnan Province, 10.VIII.1999, leg. Y. Q. Chen.

Diagnosis. The male of this species is similar to that of *P. petersi* (Karsch, 1878), but differs in: 1. tibial apophysis (Figs 2B-D) shorter, further away from the cymbium, tip of apophysis not reaching level of the base of embolus in ventral view; tibial apophysis of *P. petersi* (Figs 3B-D) closer to cymbium, with distal end beyond the level of the embolus base in ventral view; 2. embolus (Fig. 2B) shorter, originating from the position of 11:00 o'clock; that of *P. petersi* (Fig. 3B) from the position of 9:00 o'clock; 3. prolateral side of bulb with a shorter and wider apophysis (Fig. 2B) versus with a conical apophysis in *P. petersi* (Fig. 3B). The female of this species resembles that of *P. setipes* Karsch, 1879, but can be distinguished from the latter by: epigynum with deep mid-lateral incisions (Figs 2E-F) which are absent in *P. setipes* (Figs 4E-F).

Distribution. Cosmopolitan. In China recorded from the provinces: Anhui, Fujian, Shandong, Jiangsu, Zhejiang, Hubei, Hunan, Guangdong, Guangxi, Sichuan, Guizhou and Yunnan.

Plexippus petersi (Karsch, 1878)

Figs 3A-F

Plexippus petersi: Song & Chai, 1991: 21, figs 12A-D (♂ ♀); Xie, 1993: 359, figs 11-15 (♂ ♀); Peng *et al.*, 1993: 183, figs 639-645 (♂ ♀); Song *et al.*, 1999: 531, figs 310Q, 312C, 328M (♂ ♀).

Material examined: 1 ♂ 1 ♀ (MHNG), Mt. Jianfengling, Ledong District, Hainan Province, China, 1990; 1 ♂ (HNU), Mengla District, Yunnan Province, China, 5.V.1981, leg. J. F. Wang; 1 ♂ (IZCAS), Jinghong District, Yunnan Province, China, 2.XI.1988; 3 ♂ (IZCAS), Mt. Jianfengling, Ledong District, Hainan Province, China, III.1990; 1 ♂ (IZCAS), Funing District, Yunnan Province, China, 17.IV.1988.

Diagnosis. This species is very similar to *P. bhutani* and *P. paykulli*. For differences between these three species see "Diagnosis" under "*Plexippus bhutani* Zabka, 1990" and "*Plexippus paykulli* (Audouin, 1826)".

Distribution. Africa, India, Sri Lanka, Singapore, Japan, Vietnam and China (Guangdong, Guangxi, Hunan, Yunnan).

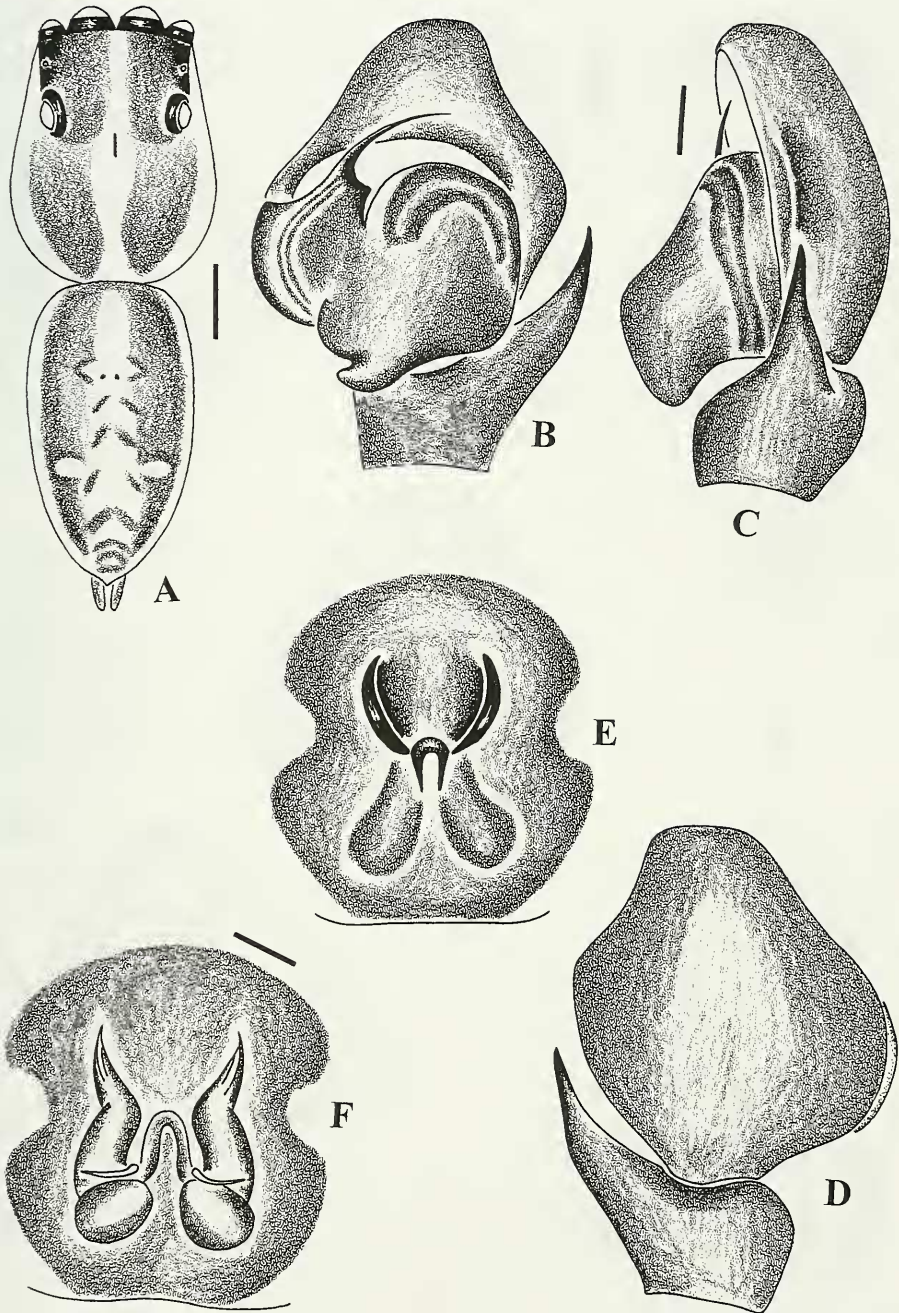


FIG. 2

Plexippus paykulli (Audouin, 1826): A. Body of male; B. Left palpal organ, ventral view; C. Left palpal organ, retrolateral view; D. Left palpal organ, dorsal view; E. Epigynum; F. Vulva. Scales = 1.0 mm (A), 0.2 mm (B-F).

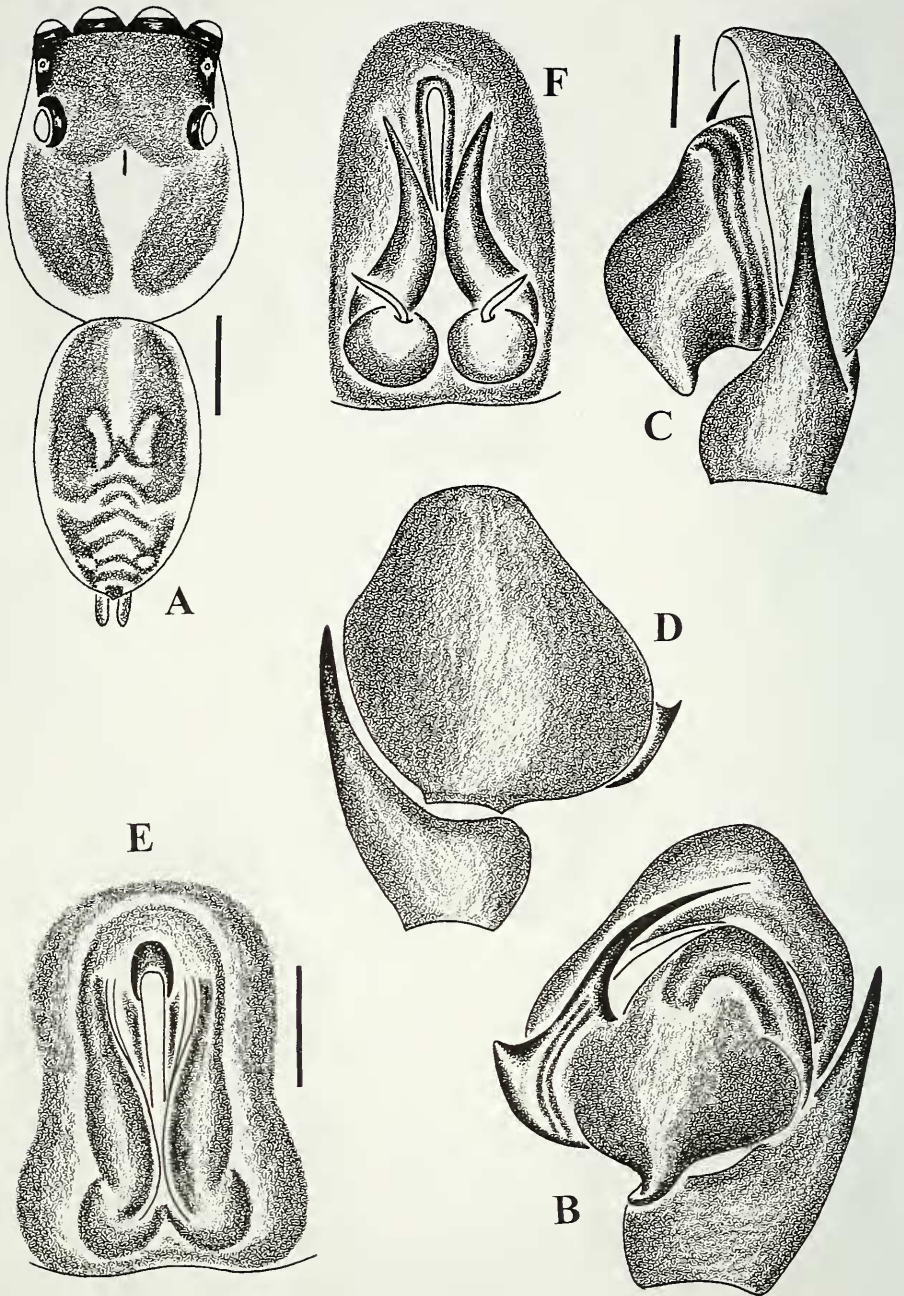


FIG. 3
Plexippus petersi (Karsch, 1878): A. Body of male; B. Left palpal organ, ventral view; C. Left palpal organ, retrolateral view; D. Left palpal organ, dorsal view; E. Epigynum; F. Vulva. Scales

Plexippus setipes Karsch, 1879

Figs 4A-F

Plexippus setipes: Yin & Wang, 1979: 37, figs 22A-E (♂ ♀); Hu, 1984: 387, figs 403.1-2 (♂ ♀); Guo, 1985: 183, figs 2-106.1-3 (♂ ♀); Zhu & Shi, 1983: 213, figs 195a-c (♀); Song, 1987: 301, fig. 257 (♂ ♀); Zhang, 1987: 251, figs 223.1-3 (♀); Feng, 1990: 214, figs 189.1-5 (♂ ♀); Chen & Gao, 1990: 194, figs 248a-c (♂ ♀); Chen & Zhang, 1991: 297, figs 313.1-4 (♂ ♀); Song *et al.*, 1993: 886, figs 63A-D (♂ ♀); Peng *et al.*, 1993: 185, figs 646-652 (♂ ♀); Zhao, 1993: 419, figs 218a-c (♂ ♀); Song *et al.*, 1999: 541, figs 311I, 312D, 328N (♂ ♀).

Material examined: 1 ♀ (MHNG), Xuanen District, Hubei Province, China, 24.V.1989; 1 ♂ (MHNG), Yingjiang Town, Dehong District, Yunnan Province, China, 10.VII; 1 ♂ (MHNG), Mt. Longqi, Jiangle County, Fujian Province, China, 11.IX.1990, leg. S. Li; 2 ♂ 1 ♀ (HNU), Liuku suburb, Yunnan Province, 25.VI.2000, leg. D. Kavanaugh & H. M. Yan; 2 ♂ 1 ♀ (HNU), Liuku along Nujiang, Yunnan Province, 26.VI.2000, leg. D. Kavanaugh, C. Griswold & H.M. Yan; 1 ♂ (HNU), Gongshan suburb, Yunnan Province, 26.VI.2000, leg. H. M. Yan; 1 ♂ (HNU), Liuku along Yongping, Yunnan Province, 26.VII.2000, leg. D. Kavanaugh & H.M. Yan; 1 ♀ (MHNG), Fulong Town, Fangchenggang City, Guangxi Zhuang Autonomous Region, China, alt. 200m, 23.IV.1999, leg. G. Q. Zhang; 1 ♀ (IZCAS), Nanjing, Zhejiang Province, China, 28.IV.1925, leg. G. Ping.

Diagnosis. This species is closely related to *P. petersi* (Karsch, 1878), but differs in: 1. prolateral side of bulb serrated (Fig. 4B) versus smooth in *P. petersi* (Fig. 3B); 2. tibial apophysis shorter (Figs 4B-D versus Figs 3B-D); 3. cymbium with a series of bent hairs near tibial apophysis versus no such hairs in *P. petersi*; 4. differences in the structure of the epigynum (see “Diagnosis” under “*Plexippus paykulli* (Audouin, 1826)”).

Distribution. China (Anhui, Fujian, Gansu, Guangdong, Guangxi, Hebei, Hubei, Hunan, Jiangsu, Jiangxi, Shanghai, Shaanxi, Shangdong, Shanxi, Sichuan, Yunnan, Zhejiang), Japan, Turkmenistan, Vietnam.

Plexippus yinae sp. n.

Figs 5A-E

Material examined: Holotype ♂ (IZCAS), paratype 1 ♂ (MHNG), northern entrance of Dali Teacher's College of Yunnan, Dali City (25.60°N, 100.1°E), 18.I.2001, leg. Z. X. Li.

Diagnosis. The new species is allied to *Plexippus setipes* Karsch, 1879, but differs in: 1. embolus shorter and stouter, with truncated tip (Figs 5B-C) versus pointed end in *P. setipes* (Figs 4B-C); 2. posterior lobe of bulb much bigger (Fig. 5B, versus Fig. 4B); 3. tibial apophysis much longer (Figs 5B-D, versus Figs 4B-D).

Etymology. The new species is named after Professor Chang-Min Yin, who has had her 80th birthday in October 2003. Professor Yin is one of the leading spider taxonomists in China.

Description. Male (holotype): Measurements: TL 5.60. CL 2.80, CW 2.00, AL 2.70, AW 1.60, AER 1.60, PER 1.60, EFL 1.00, AME 0.50, ALE 0.25, PLE 0.25, CLYH 0.20. Leg I 5.90 (1.80, 2.50, 1.10, 0.50); II 5.00 (1.60, 2.00, 0.90, 0.50); III 5.20 (1.60, 1.80, 1.10, 0.70); IV 5.80 (1.80, 2.10, 1.20, 0.70); leg formula 1, 4, 3, 2. Carapace (Fig. 5A) light brown with black margin, densely clothed in white and black hairs; ocular area black, carapace surrounded by white marginal band formed by white hairs, each PME followed by a longitudinal black band; fovea reddish brown, longitudinal; median area of thoracic region with light brown band extending forward to center of ocular area; each side of carapace with a wide, light brown submarginal band;

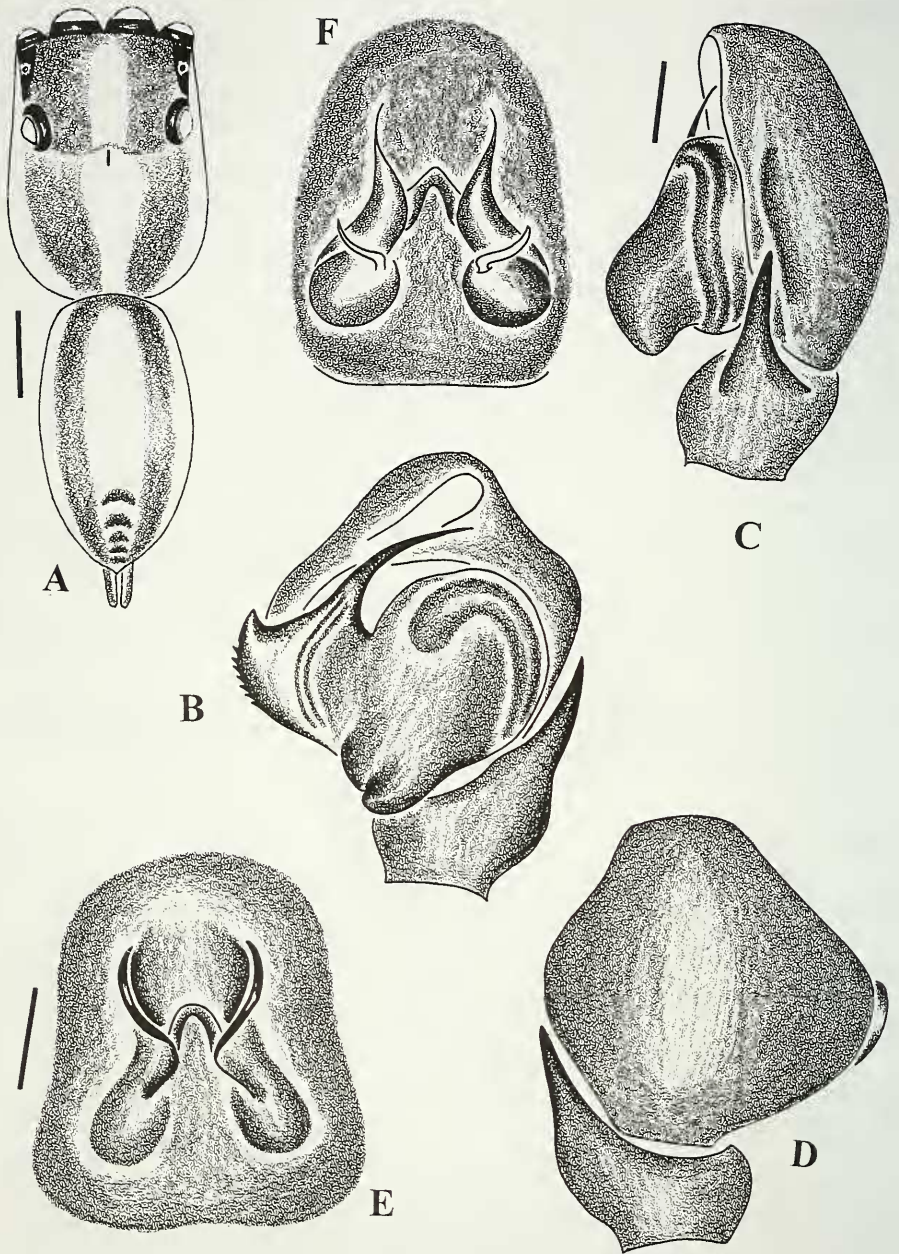


FIG. 4

Plexippus setipes Karsch, 1879: A. Body of male; B. Left palpal organ, ventral view; C. Left palpal organ, retrolateral view; D. Left palpal organ, dorsal view; E. Epigynum; F. Vulva. Scales = 1.0 mm (A), 0.2 mm (B-F).

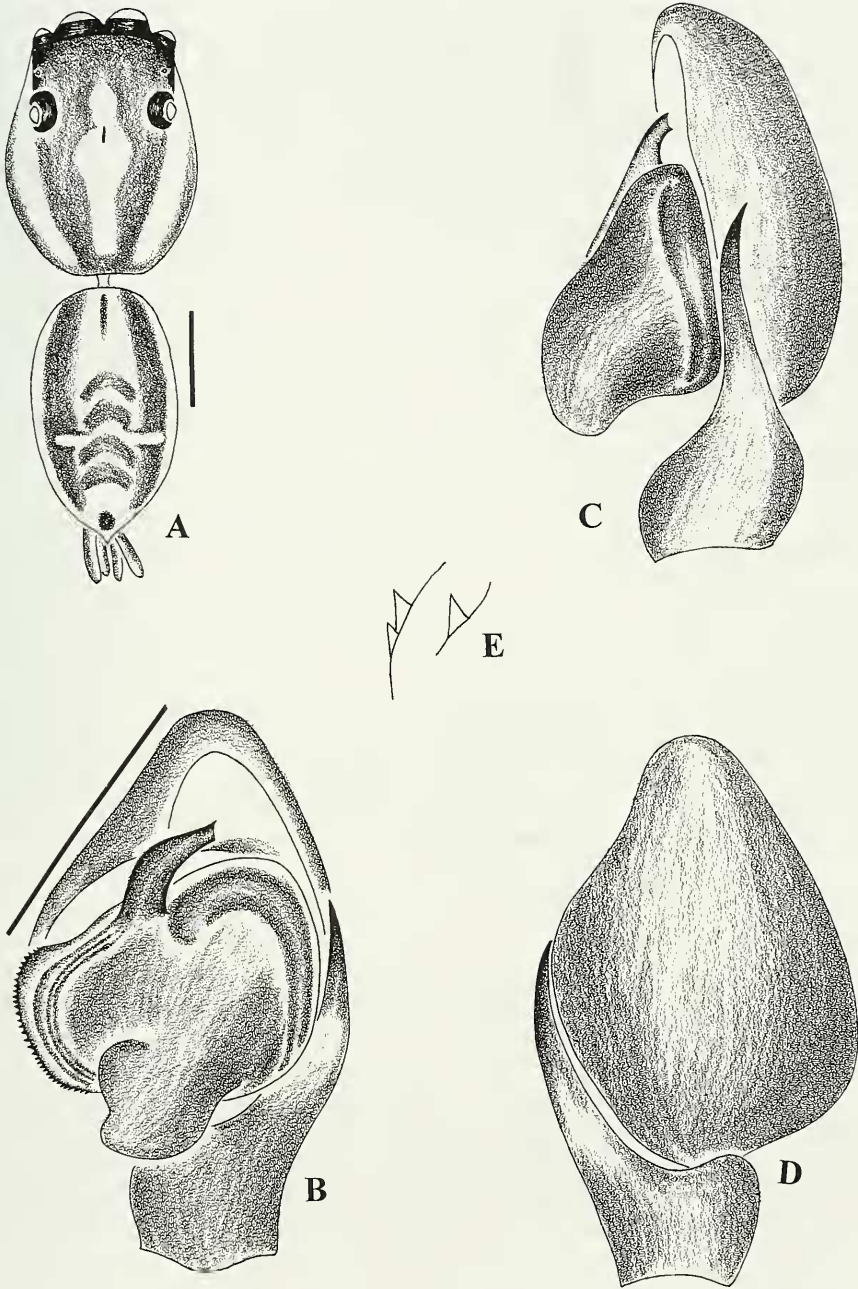


FIG. 5

Plexippus yinae sp. n.: A. Body of male; B. Left palpal organ, ventral view; C. Left palpal organ, retrolateral view; D. Left palpal organ, dorsal view; E. Teeth on cheliceral groove. Scales = 1.0 mm (A), 0.5 mm (B-D).

cervical and radial grooves indistinct. Sternum elongated oval, with smooth margin, anterior margin truncated; light yellowish brown background with black margin and grayish black median area; clothed in short black hairs and long black setae. Clypeus brown with black front margin and sides; median area densely clothed in short feather-shaped white hairs. Chelicerae brown, anterior side dark brown with few feather-shaped white hairs in basal portion; two promarginal teeth and one retromarginal tooth on cheliceral groove (Fig. 5E). Endites and labium dark brown, with dense black hairs on distal areas. Legs greyish black with lightly colored irregular patches, covered with long gray hairs and short black hairs; spines sparse and stout, 3 pairs on ventral side of tibiae I and II, 2 pairs on ventral side of metatarsi I and II. Abdomen (Fig. 5A) cylindrical, slightly wider anteriorly. Dorsum grayish black with two longitudinal black bands, each band with a transverse white band in posterior portion; cardiac band black, short and bar-shaped; 4 chevrons in posterior median area, posterior end with a distinct black mark; two pairs of light brown muscular depressions. Ventral side of abdomen dark gray with three longitudinal black bands separated by two longitudinal light yellow bands. Palpal organ: bulb with serrated prolateral margin and a big posterior lobe in ventral view (Fig. 5B); tibial apophysis longest among the known species; tibial apophysis (Figs 5B-C) shortest among the known species, its terminal end truncated.

Discussion. The embolus of male palpal organ sometimes is broken off during copulation. Its tip then remains in the female vulva. This case usually occurs in some spiders of the family Araneidae (such as the spiders of the genus *Argiope*). But no report about this can be found in the Salticidae spiders up to now. After examining the four palpal organs of the holotype and the paratype in this study, we found that all four palpal organs have the same type of embolus. Does the truncated end of the embolus of the new species result from the break of embolus during copulation? It can be exactly answered only after more materials, especially the embolus tip kept in the female vulva, will be found in future research.

Female: Unknown.

Distribution. China (Yunnan).

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REFERENCES

- BOHDANOWICZ, A. & PRÓSZYŃSKI, J. 1987. Systematic studies on East Palaearctic Salticidae (Araneae), IV. Salticidae of Japan. *Annales zoologici, Warszawa* 41: 43-151.
- CHEN, S. H. 1996. A checklist of spiders in Taiwan. *Journal of Taiwan Museum* 39: 123-155.

- CHEN, X. E. & GAO, J. C. 1990. The Sichuan farmland spiders in China. *Sichuan Science and Technology Publishing House, Chengdu*, 226 pp.
- CHEN, Z. F. & ZHANG, Z. H. 1991. Fauna of Zhejiang: Araneida. *Zhejiang Science and Technology Publishing House, Hanzhou*, 356 pp.
- FENG, Z. Q. 1990. Spiders of China in color. *Hunan Science and Technology Publishing House, Changsha*, 256 pp.
- GUO, J. F. 1985 (ed.). Farm spiders from Shaanxi Province. *Shaanxi Science and Technology Press, Xi'an*, 288 pp.
- HU, J. L. 1984. The Chinese spiders collected from the fields and the forests. *Tianjin Press of Science and Techniques, Tianjin*, 482 pp.
- KOCH, C. L. 1846. Die Arachniden. *Nuernberg*. Dreizehnter Band, 234 pp., Vierzehnter Band, 88 pp.
- LEE, C. L. 1966. Spiders of Formosa (Taiwan). *Taichung Juvenile Teachers College Publish*, 84 pp.
- PENG, X. J., XIE, L. P., XIAO, X. Q. & YIN, C. M. 1993. Salticids in China (Arachnida: Araneae). *Hunan Normal University Press, Changsha*, 270 pp.
- PLATNICK, N. I. 2003. The world spider catalog, version 3.5. American Museum of Natural History, online at <http://research.amnh.org/entomology/spiders/catalog81-87/index.html>.
- PRÓSZYŃSKI, J. 2002. Salticidae (Araneae) of the World. [Version July 2002] online at <http://www.miiz.waw.pl/salticid/main.htm>.
- SONG, D. X. 1987. Spiders from agricultural regions of China (Arachnida: Araneae). *Agriculture Publishing House, Beijing*, 376 pp.
- SONG, D. X. & CHAI, J. Y. 1991. New species and new records of the family Salticidae from Hainan, China (Arachnida: Araneae) (pp. 13-30). In: QIAN, Y. W., ZHAO, E. M. & ZHAO, K. T. (eds). Animal Science Research. *China Forestry Publishing House, Beijing*, 248 pp.
- SONG, D. X., ZHU, M. S. & CHEN, J. 1999. The Spiders of China. *Hebei Science and Technology Publishing House, Shijiazhuang*, 640 pp.
- SONG, D. X., ZHU, M. S. & CHEN, J. 2001. The Fauna of Hebei, China: Araneae. *Hebei Science and Technology Publishing House, Shijiazhuang*, 510 pp.
- SONG, D. X., ZHU, M. S. & LI, S. Q. 1993. Arachnida: Araneae (pp. 852-890). In: SONG, D. X. (ed.). Animals of Longqi Mountain. *China Forestry Publishing House, Beijing*, 1105 pp.
- XIE, L. P. 1993. New records of Salticidae from China (Arachnida: Araneae). *Acta Scientiarum naturalium Universitatis normalis Hunanensis* 16: 358-361.
- XIE, L. P. & PENG, X. J. 1993. One new species and two newly recorded species of the family Salticidae from China (Arachnida: Araneae). *Acta arachnologica sinica* 2: 19-22.
- YIN, C. M. & WANG, J. F. 1979. A classification of the jumping spiders (Araneae, Salticidae) collected from the agricultural fields and other habitats. *Journal of Hunan Teacher's College (Natural Science Edition)* 1979 (1): 27-63.
- YIN, C. M., WANG, J. F. & HU, Y. J. 1983. Essential types and the evolution of palpal organ of spiders. *Journal of Hunan Teacher's College (Natural Science Edition)* 1983: 31-46.
- ZABKA, M. 1985. Systematic and zoogeographic study on the family Salticidae (Araneae) from Vietnam. *Annales zoologici, Warszawa* 39 (44): 1-465.
- ZHANG, W. S. 1987. Farm spiders from Hebei Province. *Hebei Science and Technology Publishing House, Shijiazhuang*, 299 pp.
- ZHAO, J. Z. 1993. Spiders in the cotton fields in China. *Wuhan Publishing House, Wuhan, China*, 552 pp.
- ZHOU, N. L. & SONG, D. X. 1988. Notes on some jumping spiders from Xinjiang, China. *Journal of August First Agriculture College* 37: 1-14.
- ZHU, M. S. & SHI, J. G. 1983. Crop field spiders of Shanxi Province. *Agriculture Planning Committee of Shanxi Province, Taiyuan*, 237 pp.